# National Ocean Service

## Coastal

## Environmental

## Monitoring

## NOS Coastal Environmental Monitoring Committee (1999)

"…develop a NOS coastal environmental monitoring plan to address all activities conducted or supported by NOS related to the regular collection, management, analysis, and dissemination of environmental monitoring and observational data and information."

# The Big Picture

Call for integrated, comprehensive coastal monitoring.
Presently, fragmented, non-integrated, duplicative.

**Priorities for Coastal Ecosystem Science**
(National Research Council 1994)

**Integrating the Nation's Environmental Monitoring and Research Networks and Programs: a Proposed Framework**
(National Science and Technology Council 1997)

**An Ocean Observing System for U.S. Coastal Waters (C-GOOS)**
(U.S. Coastal Ocean Observing System Report 1999)

**Clean Water Action Plan: Coastal Research and Monitoring Strategy**
(Coastal Research and Monitoring Strategy Workgroup 2000)

# The Big Picture

## Priorities for Coastal Ecosystem Science (National Research Council 1994)

To develop and implement observation systems that focus on interactions among atmosphere, land, and water dynamics at relevant time and space scales:

- Measure diffuse inputs
- Develop indicators of biological status and processes
- Deploy improved in situ and remote sensing systems
- Link regional and national monitoring
- Improved monitoring management systems

# The Big Picture

**Three-tiered Approach**
National Science and Technology Council 1997

•Characterization of the problem (Tier 1)
Broad-scale ecological response properties as a base determined by survey, automated collection, and/or remote sensing;

•Diagnosis of Causes (Tier 2)
Issue- or resource-specific surveys and observations concentrating on cause-effect interactions;

•Diagnosis of Interaction and Forecasting (Tier 3)
Intensive monitoring and research index sites with higher spatial and temporal resolution to determine specific mechanisms of interaction needed to build cause-effect models.

## CEMC FIRST STEP: Identify Landscape

Why does NOS conduct monitoring?

How do we define monitoring?

What are we presently doing?

*Towards an Integrated NOS Environmental Monitoring Strategy*

**Report I: Current and Planned NOS Environmental Monitoring Activities**

Coastal Environmental Monitoring Committee

June 2000

http://is2.nos.noaa.gov/monitoring/cemc/

## Why Monitor?

Historical Responsibility (Survey of the Coast 1807)

Coastal Stewardship Mission

Legislative and Executive Order Mandates

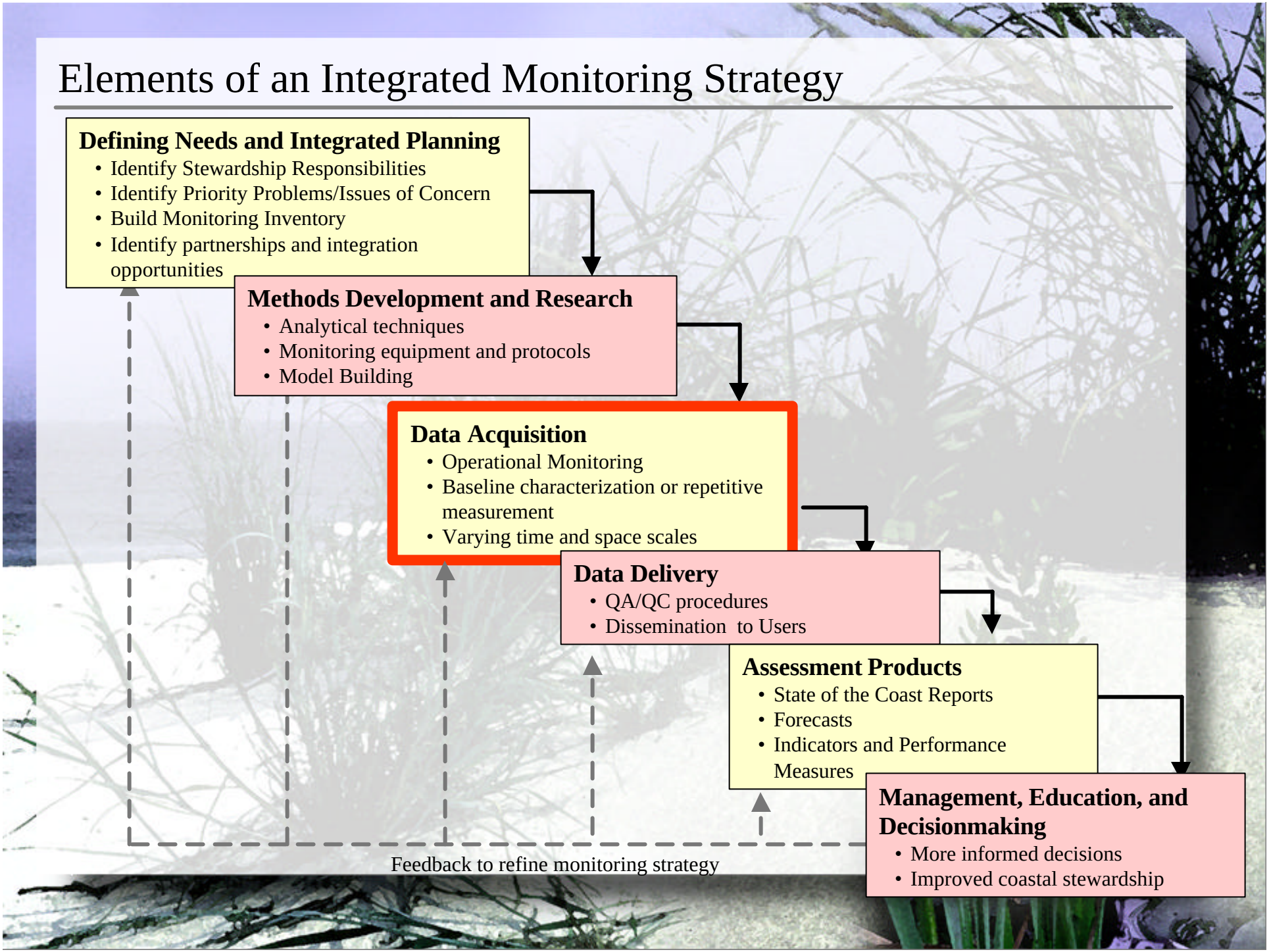
- Marine Protection, Research and Sanctuaries Act
- Coastal Zone Management Act
- Clean Water Act
- Coastal and Geodetic Survey Act

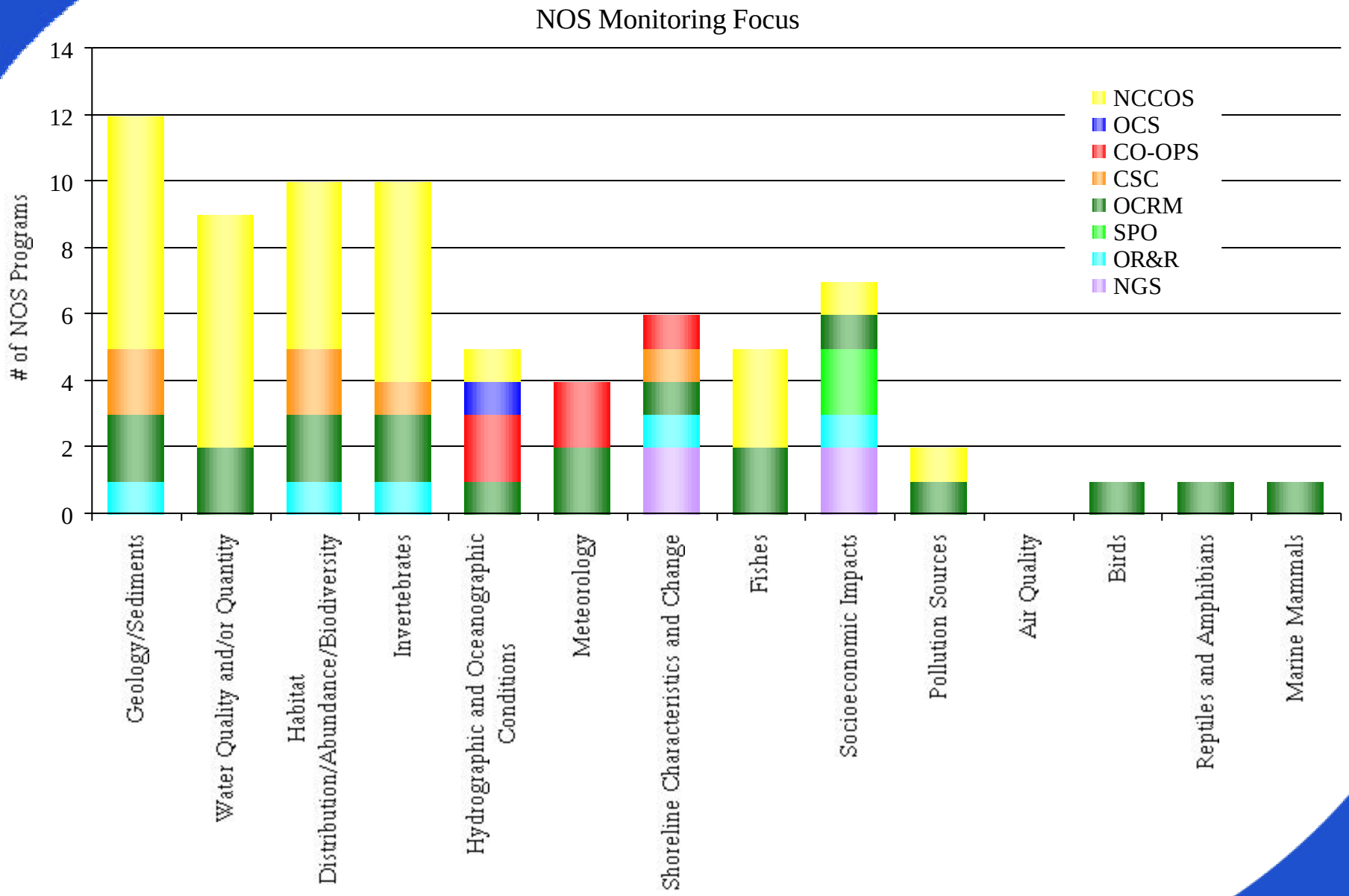
## Coastal Environmental Monitoring

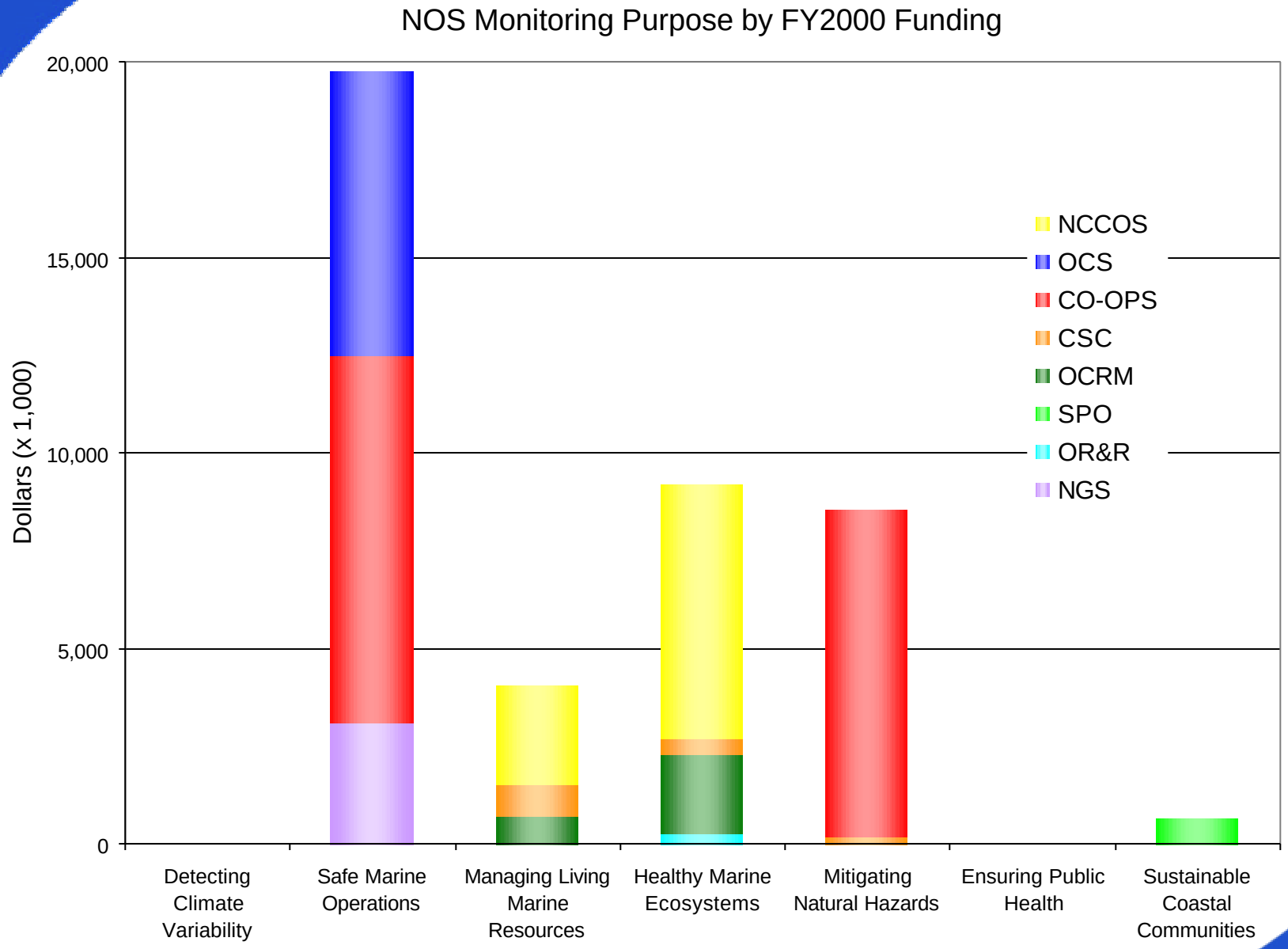
**CEMC Working Definition :**

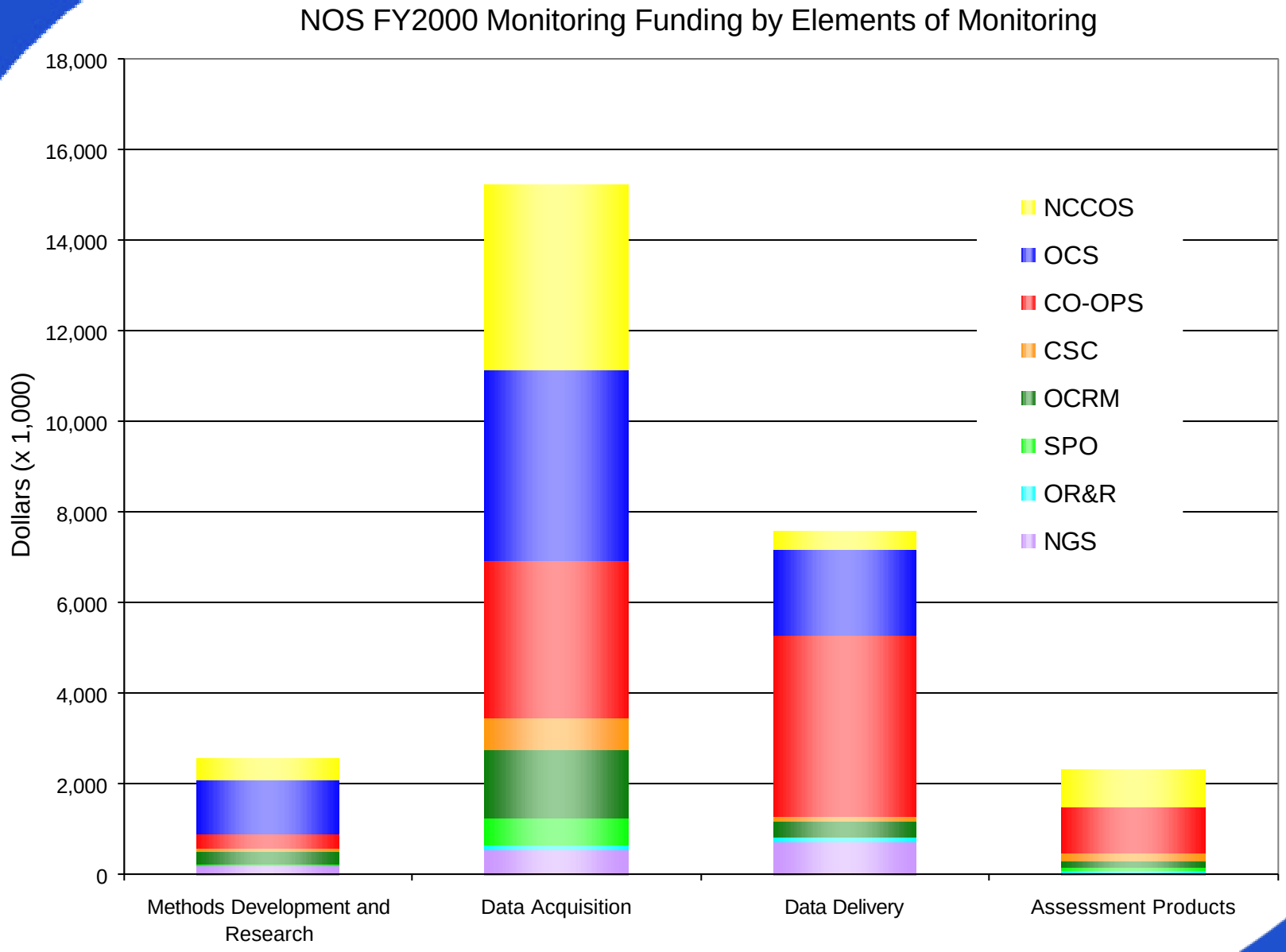
…all activities conducted or supported by NOS involving the sustained, often repetitive, collection of measurements taken to establish a baseline and / or determine a trend in environmental change, including the management, analysis, and dissemination of these measurements.

# Elements of an Integrated Monitoring Strategy




NOS Monitoring Focus
# of NOS Programs
0
2
4
6
8
10
12
14
NCCOS
OCS
CO-OPS
CSC
OCRM
SPO
OR&R
NGS
Geology/Sediments
Water Quality and/or Quantity
Habitat Distribution/Abundance/Biodiversity
Invertebrates
Hydrographic and Oceanographic Conditions
Meteorology
Shoreline Characteristics and Change
Fishes
Socioeconomic Impacts
Pollution Sources
Air Quality
Birds
Reptiles and Amphibians
Marine Mammals


NOS Monitoring Purpose by FY2000 Funding
Dollars (x 1,000)
20,000
15,000
10,000
5,000
0
NCCOS
OCS
CO-OPS
CSC
OCRM
SPO
OR&R
NGS
Detecting Climate Variability
Safe Marine Operations
Managing Living Marine Resources
Healthy Marine Ecosystems
Mitigating Natural Hazards
Ensuring Public Health
Sustainable Coastal Communities

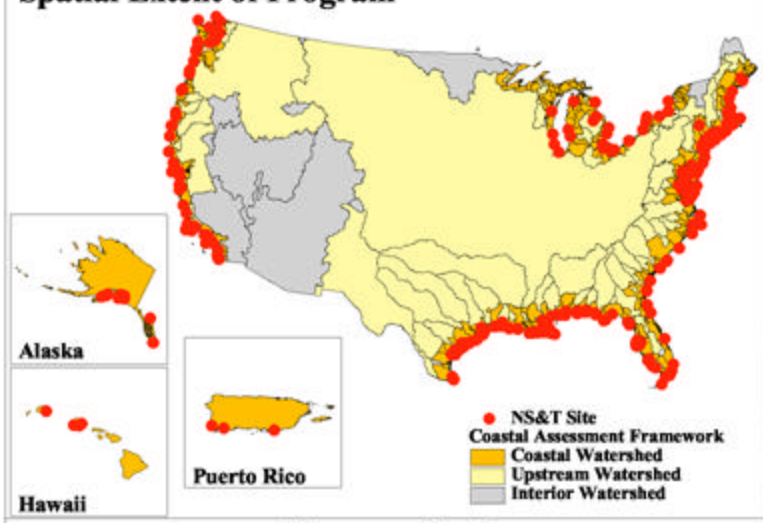

NOS FY2000 Monitoring Funding by Elements of Monitoring
Dollars (x 1,000)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
NCCOS
OCS
CO-OPS
CSC
OCRM
SPO
OR&R
NGS
Methods Development and Research
Data Acquisition
Data Delivery
Assessment Products

*NOS Environmental Monitoring Inventory*

**National Centers for Coastal Ocean Science (NCCOS)**

# National Status and Trends (NS&T) - Mussel Watch

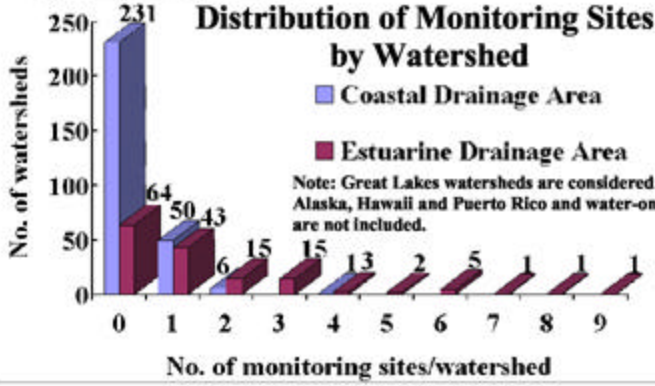
## Spatial Extent of Program




## Program Facts

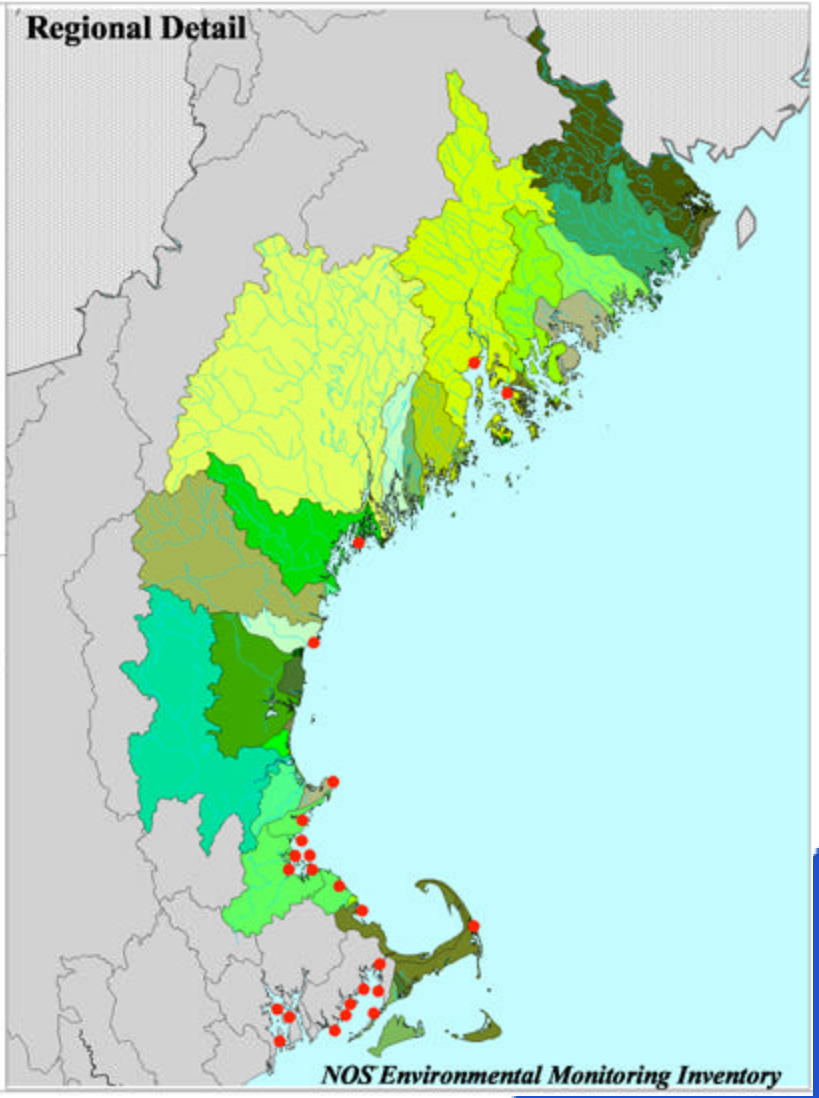
- Monitors organic and inorganic contaminants in sediments and mollusks.
- Period of record starts December 1986 and is ongoing.
- Frequency of sampling/collection is annual, biannual, and every 5-10 years depending on the parameter.

## Distribution of Monitoring Sites by Watershed




Note: Great Lakes watersheds are considered CDAs. Alaska, Hawaii and Puerto Rico and water-only CDAs are not included.

## Regional Detail

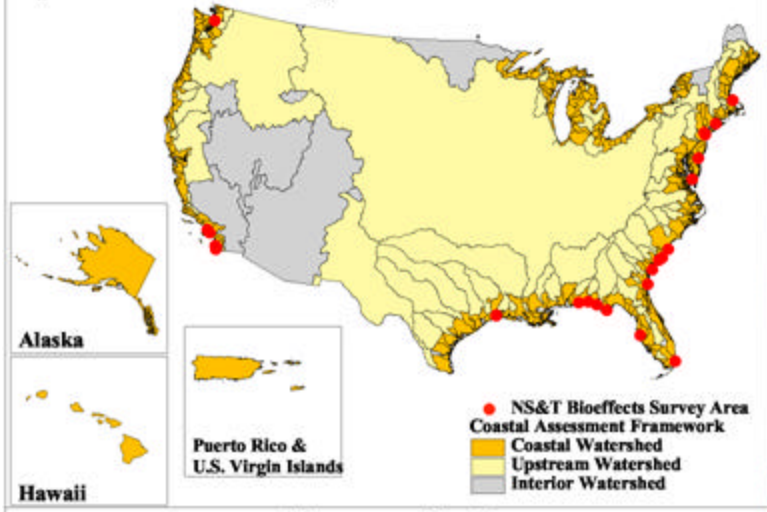


*NOS Environmental Monitoring Inventory*

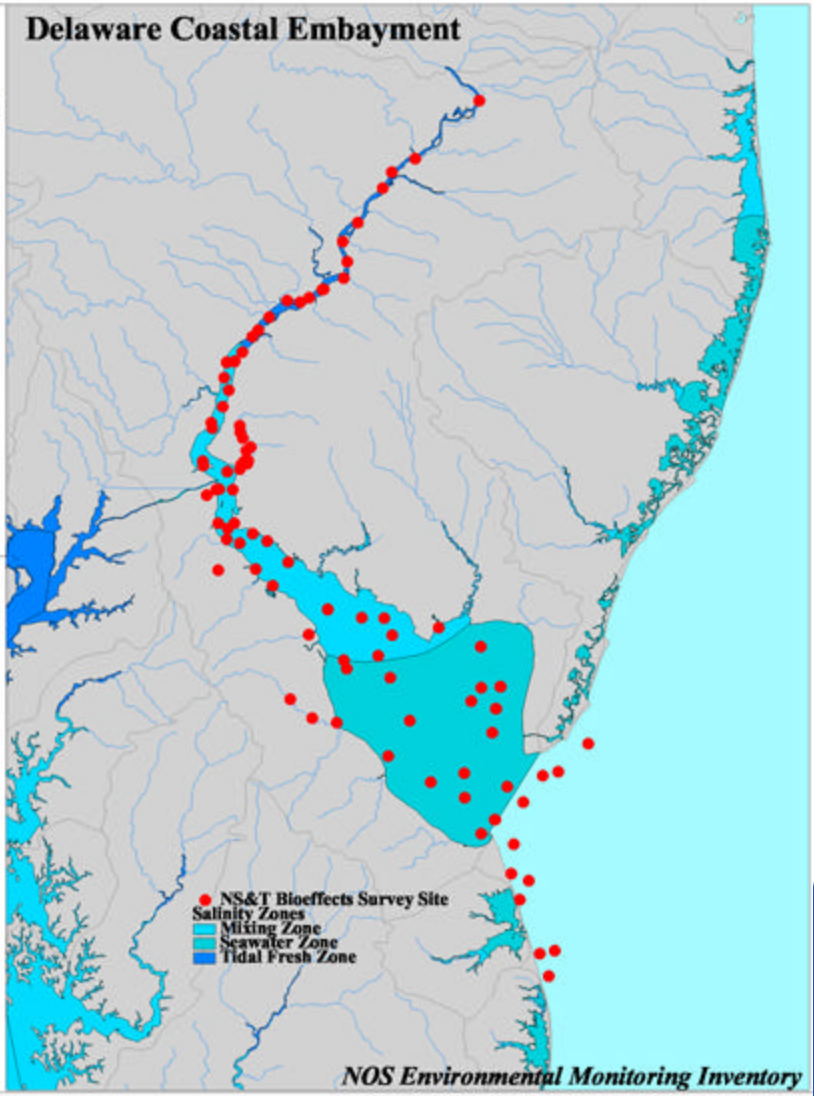
**National Centers for Coastal Ocean Science (NCCOS)**

# National Status and Trends (NS&T) - Bioeffects Survey

## Spatial Extent of Program




## Delaware Coastal Embayment




## Program Facts

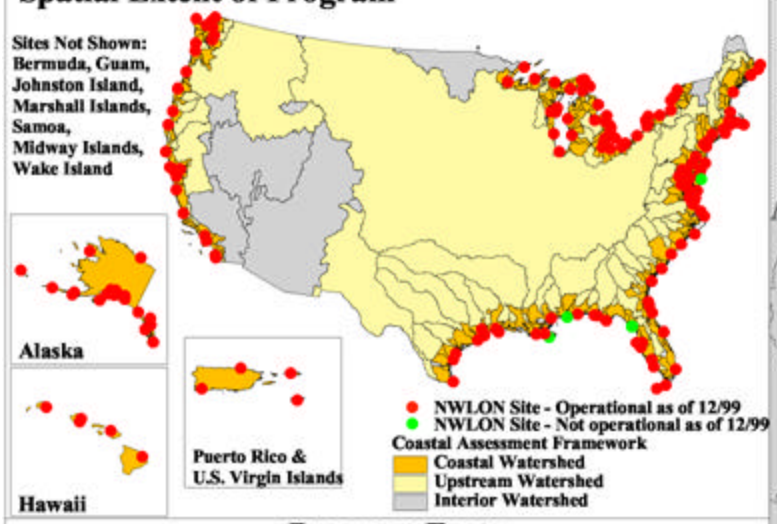
• Period of record starts in 1989 and is ongoing. Recent surveys listed below.

| Survey Area | Total Survey Area (sq mi) | No. of Samples | Date of Survey |
|---|---|---|---|
| Boston Harbor | 56.1 | 55 | Jun/Jul 1993 |
| Long Island Sound Bays | 71.9 | 60 | Aug 1991 |
| Hudson-Raritan Esty. | 350.0 | 117 | Mar/May 1991 |
| Newark Bay | 12.7 | 57 | Jan/Mar 1993 |
| Winyah Bay | 7.3 | 9 | Jun 1993 |
| Charleston Harbor | 41.1 | 63 | Jun/Jul 1994 |
| Leadenwah Creek | 1.7 | 9 | Jun/Jul 1994 |
| Savannah River | 13.1 | 60 | May 1995 |
| St. Simon Sound | 24.6 | 20 | Aug 1992/93 |
| Biscayne Bay | 484.2 | 226 | Jun 1994/95 |
| Tampa Bay | 550.0 | 165 | Jun 1994 |
| Apalachicola Bay | 187.6 | 9 | May 1993 |
| Choctawatchee Bay | 254.5 | 39 | Jun 1994 |
| St. Andrew Bay | 127.0 | 31 | May 1993 |
| Pensacola Bay | 245.9 | 66 | Aug 1995 |
| Sabine Lake | 245.9 | 66 | Aug 1995 |
| S. Cal. Small Estuaries | 5.0 | 30 | Aug/Sep 1994 |
| San Pedro Bay | 53.8 | 105 | Jul, Sep 1992 |
| Mission Bay | 6.1 | 11 | Mar/Aug 1993 |
| San Diego River | 0.5 | 2 | Mar/Aug 1993 |
| San Diego Bay | 34.0 | 117 | Mar/Aug 1993 |
| Tijuana River | 0.3 | 6 | Mar/Aug 1993 |
| Delaware Bay | na | 92 | 1997 |
| Chesapeake Bay | na | approx. 200 | 1998-2000 |
| Puget Sound | na | approx. 300 | 1997-99 |

*NOS Environmental Monitoring Inventory* **Center for Operational Oceanographic Products and Services (CO-OPS)**

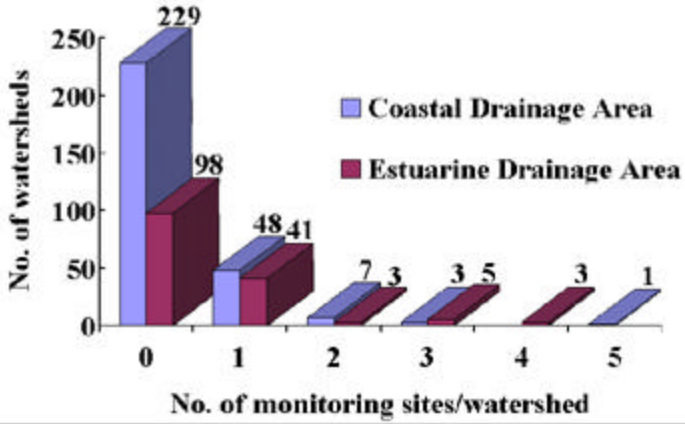
**National Water Level Observation Network (NWLON) - Long Term Water Level Measurement Stations**

## Spatial Extent of Program

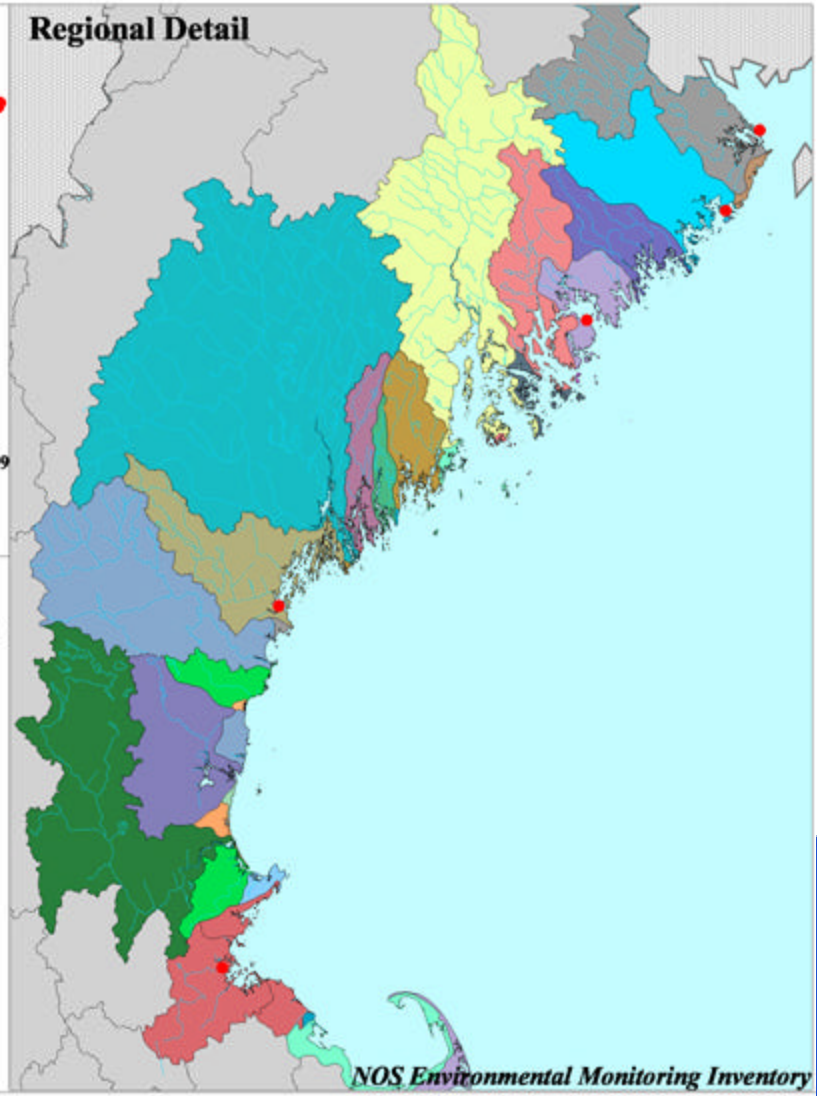



## Program Facts

- Period of record starts in the 1850s and is ongoing.
- Frequency of sampling/collection ranges from six minutes to monthly, with six minute frequency starting in the 1980s.




## Regional Detail

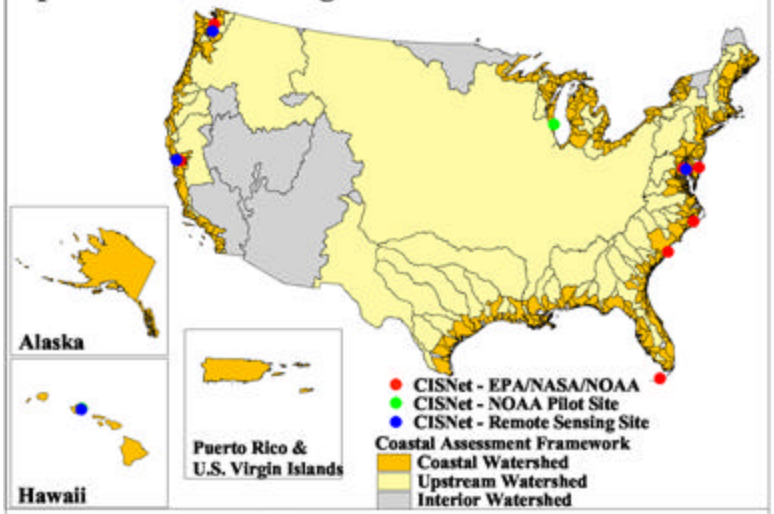


*NOS Environmental Monitoring Inventory*

**National Centers for Coastal Ocean Science (NCCOS)**

# Coastal Intensive Site Network (CISNet)

## Spatial Extent of Program




## Program Facts

- Monitors information on water quality and/or quantity to gauge ecosystem health, early warning of future problems, and ecostressors.
- Period of record starts December 1986 and is ongoing.
- Frequency of sampling/collection ranges from hourly to seasonally.

### Summary for the Two NOAA/EPA CISNet Sites

**Southwestern Lake Michigan, Wisconsin**

- Will continue a 50-year nearshore sample record, supplementing it with an offshore station, to provide a tool for assessment of systematic environmental change.

**Kaneohe Bay, Hawaii**

- Will identify natural indicators of environmental stress with potential for remote sensing, to enable rapid identification and spatial resolution of impacts.

## Program Areas

| CISNet Site | Type |
|---|---|
| Neuse River Estuary, North Carolina | NASA/NOAA/EPA |
| Florida Keys National Marine Sanctuary, Florida | NASA/NOAA/EPA |
| San Pablo Bay, California | NASA/NOAA/EPA |
| Delaware's Inland Bays, Delaware | NASA/NOAA/EPA |
| San Pablo Bay, California | Remote Sensing |
| Southwestern Lake Michigan, Wisconsin | NOAA/EPA |
| North Inlet-Winyah Bay National Estuarine Research Reserve, South Carolina | NASA/NOAA/EPA |
| Rhode River embayment, Maryland | NASA/NOAA/EPA |
| Puget Sound, Washington | NASA/NOAA/EPA |
| Puget Sound, Washington | Remote Sensing |
| Kaneohe Bay, Hawaii | NOAA/EPA |
| Kaneohe Bay, Hawaii | Remote Sensing |
| Choptank River, Maryland | NASA/NOAA/EPA |
| Choptank River, Maryland | Remote Sensing |

## “Best Ideas” (inward-looking)

- Improve coordinated planning within NOS to capitalize on opportunities (e.g. sharing platforms)
- Focus NOS monitoring efforts on marine protected areas and trust responsibilities
- Identify and further develop national “reference sites” for NOS monitoring activities
- Improve assessments and data synthesis products
- Create an Internet-based portal site to access all of NOS’ monitoring efforts and data

## “Best Ideas” (outward-looking)

- Achieve integrated coastal monitoring through state-federal partnerships
- Help identify and develop monitoring protocols to facilitate data sharing and integration
- Investigate applicability of “three-tier” model to NOS programs
- Support coastal monitoring strategy and link with CGOOS and other coastal monitoring efforts

**Continuing**

NCCOS - National Status and Trends Program
NCCOS - Gulf of Mexico Hypoxia Assessment
NCCOS - Harmful Algal Bloom Monitoring
OCRM - NERR System-wide Monitoring Program
OCRM - NMS Monitoring Activities
OCRM - NMS Coral Reef Monitoring Program
CSC - Land Cover Change Analysis (C-CAP)
SPO - Valuing the Coast
OCS - Hydrographic Surveying
CO-OPS - National Water Level Observation Network
CO-OPS - Physical Oceanographic Real Time Systems

**New**

Coastal Storms (PREWICS)
Coastal Ecological Forecasting

# Nutrient Pollution

•Coastal Zone Management Act
•National Eutrophication Assessment
•Gulf of Mexico Hypoxia Study
•Focus for monitoring discussions
• NOS Nutrient Pollution Team
•White Paper - “Nutrient Pollution: Current National Ocean Service Activities and Alternatives for Enhancement”

**NOS Nutrient Pollution Plan (early draft)**

•National Eutrophication Assessment II
•Integrated Watershed Assessments
•Place-based stewardship (NERR and NMS)
•Forecasting Effects of Nutrient Pollution